MULTIMEDIA UNIVERSITY TM

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 1, 2017/2018

ETN3056 – COMMUNICATIONS NETWORKS
(TE)

28 OCTOBER 2017
9:00 AM – 11:00 AM
(2 Hours)

INSTRUCTION TO STUDENT

1. This Question paper consists of 5 pages (including this cover page) with 4 Questions only.

2. Attempt **ALL** questions. All questions carry equal marks and the distribution of the marks for each question is given.

3. Please print all your answers in the Answer Booklet provided.

Question 1 (25 marks)

(a) Public Switching Telephone Network (PSTN) is based on circuit swiching technique.

(i) Explain what does it mean by **dedicated connection** in PSTN. [4 Marks]

(ii) Describe what is an **in-band** signaling in PSTN network. [2 Marks]

(ii) List the advantages of **out-of-band** signaling as compare to in-band signaling in PSTN network. [2 Marks]

(b) Design a multistage crossbar switching that supports 28 users. Given that the number of input ports for the first stage (n) is 7. The system is a non-blocking system.

(i) Calculate the number of 2^{nd} stage switches. [4 Marks]

(ii) Draw the multistage system. Label all components. [6 Marks]

(iii) What is the total number of crosspoints? [4 Marks]

(iv) Compare your result in b(iii) with a single stage switch with the same number of users. Is there any cross points reduction as expected? [3 Marks]

Continued .....

Question 2 (25 marks)

(a) How is **Digital Subsriber Line** (DSL) better than **dial-up** network? Give one similarity between the two technologies. [4 Marks]

(b)

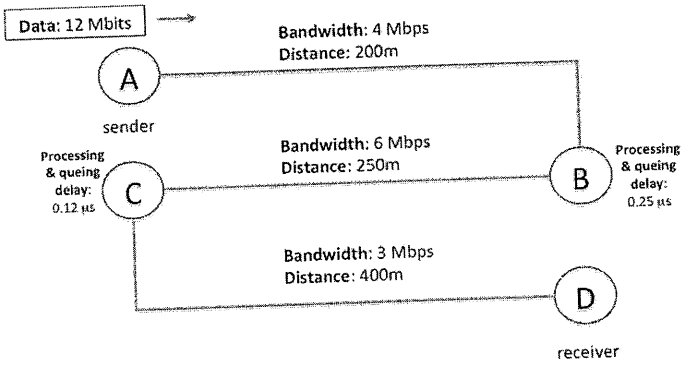

Figure Q2(b)

With reference to **Figure Q2(b),** answer the following questions given that the speed of the transfer is 2×10^8 m/s.

(i) Find the total propagation delay. [4 Marks]

(ii) Find the total transmission delay. [4 Marks]

(iii) Find the end-to-end latency. [2 Marks]

(iv) What is Round Trip Time (RTT)? Hence, what is the value of RTT for this system? [2 Marks]

(iv) How many bits can be transmited before the first bit reaches the other end of the channel? [3 Marks]

(c) The following questions are related to Internet Protocol version 4 (IPv4) and Internet Protocol version 6 (IPv6).

(i) Comparing between the number of bits used to represent IPv4 and IPv6, how many respective addresses both protocol can have? [4 Marks]

(ii) List **two (2)** benefits of IPv6. [2 Marks]

Continued .....

Question 3 (25 marks)

(a) List **five (5)** differences and/or similarities between Ethernet and Wireless Fidelity (WiFi). [5 Marks]

(b) The following questions are related to WiFi.

(i) Discuss the advantages of deploying WiFi as compared to wired connection. [3 Marks]

(ii) What are the differences between ad-hoc and infrastructure mode in IEEE 802.11? [3 Marks]

(iii) What are the changes in IEEE 802.11ac with respect to previous versions of Wireless Local Area Network? [3 Marks]

(c) Describe the functions of the following:

(i) Carrier Sense Multiple Access (CSMA) [3 Marks]

(ii) Carrier Sense Multiple Access with Collision Detection (CSMA/CD) [4 Marks]

(iii) Carrier Sense Multiple Access with Collision Avoidance (CSMA/CA) [4 Marks]

Continued .....

Question 4 (25 marks)

(a) Explain the evolution of wireless cellular network from second generation (2G) to third generation (3G). Your explanation should include but not limited to the data rate, core network type and type of services.

[7 Marks]

(b) A telecommunication company was awarded frequency spectrum ranging between 900-950MHz and 1830-1880MHz. The system will be designed using frequency division duplexing (FDD) to support two-way communications.

(i) Find the number of channels that this system can support if frequency division multiplexing (FDM) is use with 3.8 kHz of voice channel.

[4 Marks]

(ii) Consider time division multiplexing (TDM) where each voice channel has a bandwidth of 3.8 kHz and sampled using 7 bits per sample. Find the TDM data rate if it can support 1315 channels.

[4 Marks]

(iii) If the bandwidth efficiency is 1 bps/Hz in b(ii), compare the total bandwidth and the number of channels between the two systems in b(i) and b(ii).

[3 Marks]

(c)

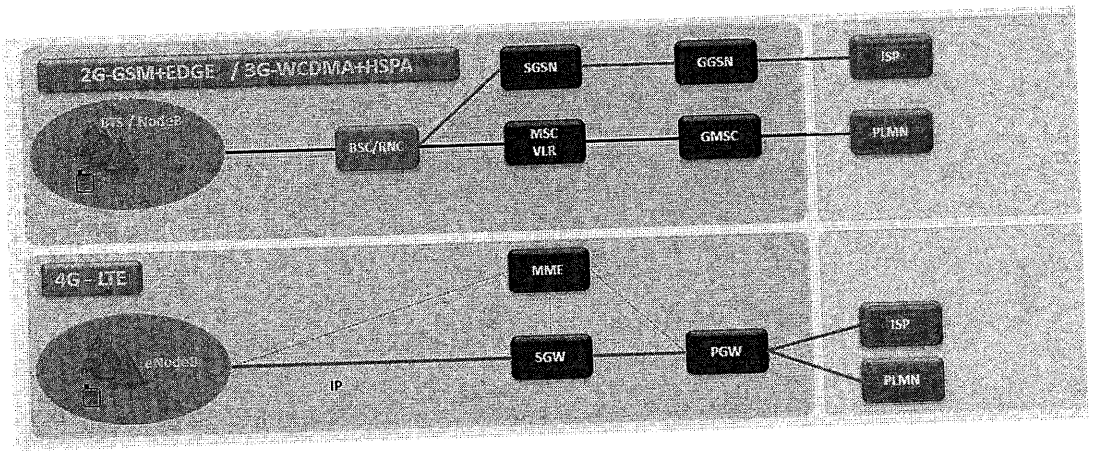

Figure Q4(c)

Figure Q4(c) show the architecture of a third generation (3G) and forth generation (4G) network.

(i) Justify if NodeB and eNodeB have the same function? What happen to the function of RNC?

[4 Marks]

(ii) What is the main function of MME?

[3 Marks]

End of Paper